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03-Jul-03 9 pages Faxed
Application No. 10/070,342

IN UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of:
Michael Douglas Spears

Filed: 28 February 2002

Serial No: 10/070,342

Confirm No: 2921

Docket: SPER -100A

For: Tool and Method for Cutting Powered by an Electromagnetic (EM) Source

Examiner: A. F. Roane
Group Art: 3739

FACSIMILE TRANSMISSION 9 pages total in this attachment
I hereby certify under 37 CFR 1.8(a) that a signed original copy of this paper is being sent as authorized by 37 CFR 1.6(d) on the date indicated below via standard telephonic facsimile transmission.

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ATTN: **Examiner Aaron F. Roane**

ATTACHMENT to the Amendment/Arguments

Commissioner for Patents, P.O. Box 1450, Alexandria VA 22313-1450

on
Date of Transmission: 3rd day of July, 2003
By: Jean M Macheledt (printed name)

Jean Macheledt (E-signature)

DECLARATION (under 37 CFR § 1.68) PURSUANT TO 37 C.F.R. § 1.131 TRAVERSING GROUNDS OF REJECTION made under 35 U.S.C. § 103

Mail Stop: NON-fee Response
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

FAX RECEIVED
JUL 03 2003
GROUP 3700

Dear Sir:

I, Michael Douglas Spears, a citizen of the United States, hereby declare and state:

THAT, I am the inventor of the claimed invention and therefore I am an applicant of the provisional patent application (No. 60/152,004), the PCT international application PCT/US00/23874—both of which are claimed as priority documents—as well as the nonprovisional patent application identified above and to which my statements apply.

THAT during the years 1995 – 1996 I was awarded an M.S. degree in Electrical Engineering from the University Oklahoma; That I have and continue to work in the commercial sector on various engineering projects.

THAT as evidenced by the attached sections, the invention claimed in the patent application identified above and to which my statements apply, was conceived and thought of at least as early as prior to the 5th of June 1997 and since that time was fully

described and explained in my provisional patent application (No. 60/152,004) filed on 09/01/99 along with its listed attachments, and subsequently fully described and explained in my utility, nonprovisional patent application filed 28th of February 2002 (No. 10/070,342). Throughout the period of time from its conception, including prior to 5th of June 1997, I have diligently worked on reducing my invention to practice, including preparing engineering-type drawings and building structures according to my patent application disclosure. for purposes of experimentally testing to confirm effectiveness consistent with engineering analyses I'd performed.

THAT the attached sections, seven pages including pg x, 11, 21 – 22, Figure 3.2, 68 – 69, were taken from ATTACHMENT B identified as "in a formal thesis format to communicate features of, in particular, an initial embodiment of the invention" filed and incorporated by reference into my provisional patent application technical disclosure (No. 60/152,004) filed 09/01/99.

THAT I hereby declare that all statements made herein, in this 2-page DECLARATION, are of my own knowledge and that I have done my best to ensure they are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of this patent application or any patent issuing to Spears thereon.

Signature: Michael Douglas Spears
Typed name: Michael Douglas Spears, M.S.

Signed this: 30 day of the month June in year 2003

ATTACHMENT B

SPER-100P
Filed
(1 SEPT 1999)

Abstract

The Electromagnetic Field Focusing (EFF) System is a surgical device used to cut tissue and to cauterize and coagulate any intersecting blood vessels so that bloodless surgery will occur. It has considerable advantages over LASERS, electrocauteries, mechanical cutters, and scalpels in terms of precision, safety and cost in many surgical procedures. The primary goals of this research effort are to redesign the EFF system probe handle to minimize the size and maximize the power efficiency, in addition, design an optical switch on the probe handle.

The principle of how the EFF probe works is as follows: An electrical conducting material, such as the human tissue, is placed under an oscillating electromagnetic field source. Currents are thereby induced, due to the electromagnetic field, on the surface of the tissue and are made to converge on the tip of the probe. As a result cutting of the tissue occurs. Only when the power switch is turned on and contact is made between the tip of the probe and the tissue, does the vaporizing (cutting) action occur.

The purpose of using an optical switching device to switch the radio frequency(RF) generated signal, instead of an electrical device is to take advantage of the non-interference properties of light. Since light is composed of photons, instead of electrons, it is immune to interference due to the electromagnetic field set up by the operation of the EFF probe. The optical switch techniques considered and design selected will be discussed.

In the design of an improved EFF system probe handle, impedance matching the source ,RF generator and amplifier, to the load , the probe and skin tissue, proved to be critical in obtaining a maximum power transfer to cut the tissue. The theory and application associated with the design improvements of the probe handle will be discussed.

The experimental procedure and results of a comparison between the current probe and the new probe will be observed and analyzed.

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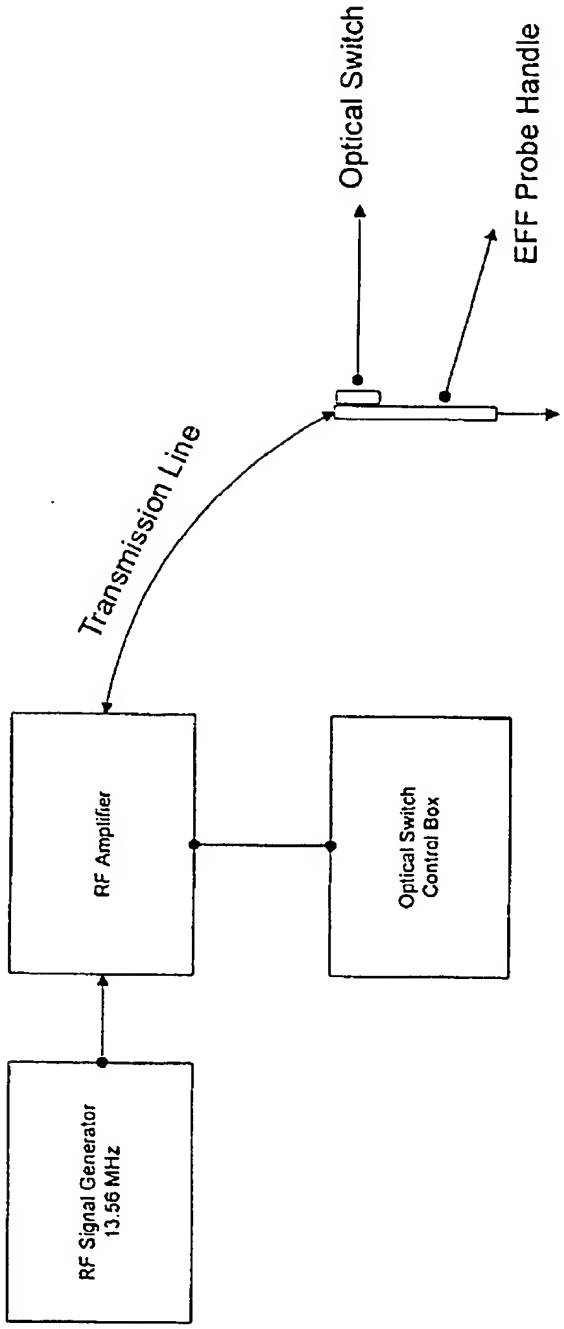

Figure 1.5. Proposed EFF Setup

the optical system.

The mechanical switch designed is a spring loaded device which locks the prism in either an "on" position or an "off" position depending on the direction in which the surgeon turns the knob (see figure 2.4). As the knob is turned the spring forces a bearing into a groove; this locks the probe in position to assure proper alignment for the signal to be transferred from the source fiber to the detector fiber (see figure 2.4).

The dimensions of the mechanical switch are small enough so that it could be attached to the probe handle. This will eliminate the on/off foot pedal switch. As a result it will give the surgeon more mobility and a greater degree of freedom; in addition, it gives the switch an immunity to electromagnetic interference.

The optical switch system consists of a control box and an optical switch. The control box contains the souce and detector fiber and the circuitry necessary to provide constant voltage and current for the optical souce(LED). In addition, it contains the detector/amplifier circuitry whose output is interfaced with logic gates to control the operation of the RF generator.

As mentioned earlier, the optical switch consists of a 6mm X 6mm X 8mm porro prism, which is fixed into a spring-loaded button. The spring-loaded button is then mounted into a 4cm X 4cm piece of plexiglass (see figure 2.4).

The optical switching was accomplished by means of the porro prism placed across the two optical fibers. Holes were precisely cut into the plexiglass to fix the source and detector fibers. The optical power from the souce fiber was coupled into the detector fiber through the total internal reflection in the prism (see figure 2.4). The optical switch is

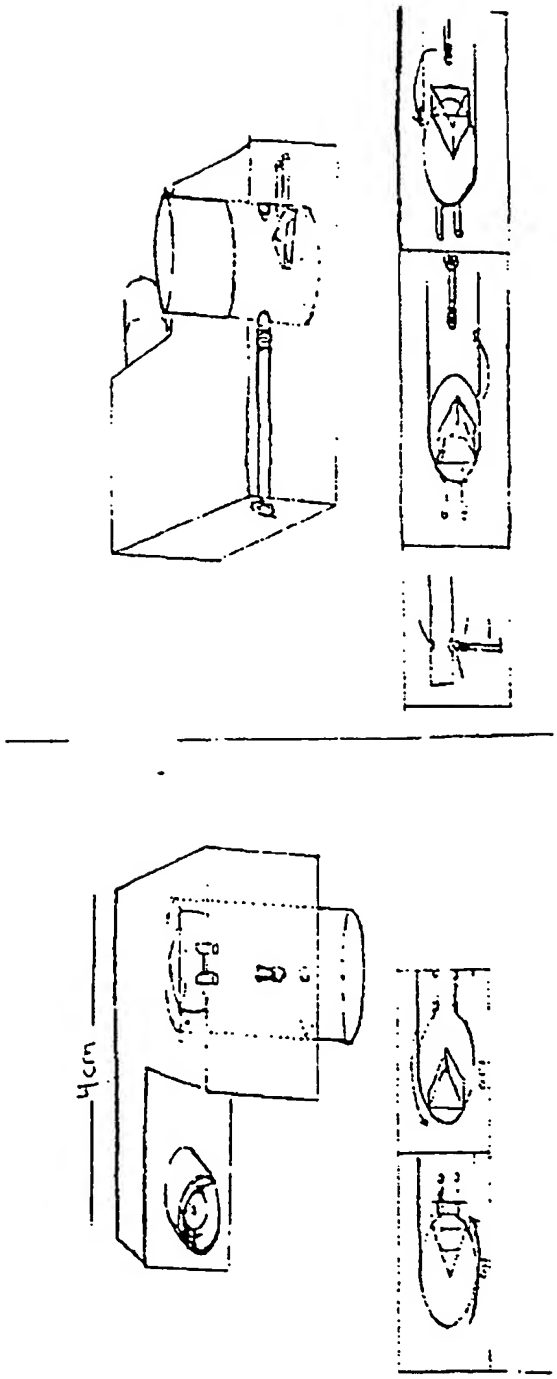

Figure 2.4 Mechanics of Optical Switch

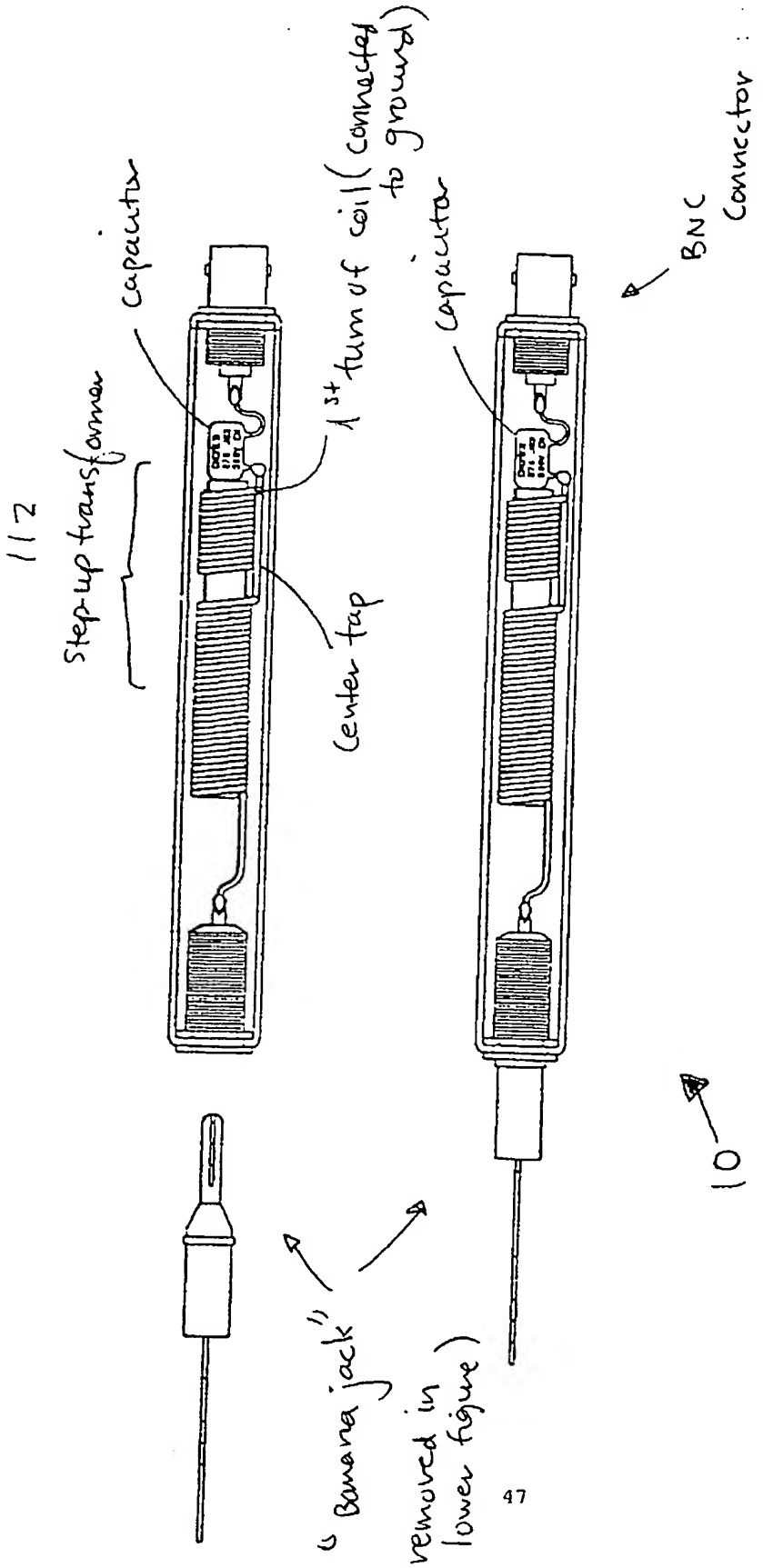

Figure 3.2. Components of EFF probe handle

banana jacks & BNC connector

competitive surgical devices.

5.1 Redesign of EFF System

As mentioned earlier, one of the goals of this research was to redesign the current EFF probe system to reduce size and cost, and to improve upon its power efficiency.

Surgeons felt that the probe was too bulky. They also felt unsafe because of the large amounts of power(40-50 watts)and electromagnetic field radiation necessary for the device to operate properly. This was the biggest task and was of great importance. In order to overcome these problems the probe's power efficiency must improve tremendously. The EFF probe's internal transformer configuration to be redesign in such a way to have a maximum cutting power efficiency.

The EFF probe system had to be impedance matched from the source to the load properly in order to obtain a maximum power transfer from the source to the tip of the probe and tissue. Impedance matching consisted of redesigning the probe's internal coil configuration. The LC network internal to the probe was properly tuned to resonate at the FCC specified frequency of 13.56MHz. A special iron-powder core with permeability, =10 was inserted into the LC coil network. The purpose of the core was to increase the permeability which in turn increased or stepped up the inductance to the necessary value

in order for the inductive reactance and capacitance reactance to cancel each other at the prescribe frequency of 13.56MHZ to obtain resonance. The impedance matching was done by way of an HP network analyzer.

The iron-powder core and its high , increased the inductance of the system. This increase allowed the dimensions of the transformer configuration to be reduced which ultimately reduced the dimensions of the probe handle to almost pencil size.

By redesigning the transformer (LC network) configuration and impedance matching the source to the load, many problems were solved. The size was reduced to about pencil size. The tip was made to be detachable. The cost of the EFF system went down tremendously because the impedance matcher system and its expensive equipment were no longer necessary. This is because the impedance matching LC network was built internal into the probe. The EFF system is then reduced to a three-component system which consists only of an RF generator, RF amplifier and probe with quarter-wave length cable. In addition, due to impedance matching, the amount of power necessary to cut was reduced from 50 Watts to 10 Watts, which increased the power efficiency. A special fit shield heat shrink foil was used to insulate the handle from the surgeon's hand.